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Parent-infant interaction: Attachment, differential responsiveness and directional effects at 8 months.

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PARENT-INFANT INTERACTION: ATTACHMENT, DIFFERENTIAL RESPONSIVENESS AND DIRECTIONAL EFFECTS AT 8-MONTHS

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Abstract

Mothers, fathers, and their 8-month old infants were observed at home in a study of the dyadic and triadic interaction processes. The subjects consisted of 20 white, middle-class first-born infants and their parents, whose interactive behaviors were observed in a series of three home visits. The observed infant behaviors of interest were vocalizing, looking, smiling, touching, reaching, 3" proximity, laughing, and crying to the parent, as well as responding to the observer. Infants were tested for proximity seeking and selective responding to ascertain level of attachment. Recorded parental behaviors directed at the infant consisted of vocalizing, looking, smiling, holding, physical stimulation, giving objects and punishment. Measures of parental teaching strategy and holding styles were also included.

Interactional analysis revealed that female infants behaved in a consistent manner toward both mother and father in both the dyad and triad settings whereas male infants responded differently towards their parents and were more situation specific in their responses in the dyad and triad settings. Sex differences also were present among parents, with fathers displaying more playful behavior with the infant, while mothers assumed the caretaking role. The most salient behaviors in the interaction sequences were vocal-

izing, looking and smiling, indicating a high degree of attachment between infants and parents.

Analysis of the proximity seeking and selective responding data revealed that both male and female infants were equally attached to mothers and fathers. However, the attachment relationships differed. Fathers were more affiliative and playful than mothers, whereas mothers adopted the role of caretaker. Both mothers and fathers employed the teaching strategy of "modeling and verbalizing" when instructing their infants on a detour task.

In general the parent-infant relationship is characterized by reciprocity, with each participant influencing the others behavior. However, mother-infant and father-infant interaction sequences differ both qualitatively and quantitatively.

THESIS ACCEPTANCE

Accepted for the faculty of the Graduate College, University of Nebraska, in partial fulfillment of the requirements for the degree Master of Arts, University of Nebraska at Omaha.

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Chapter I

INTRODUCTION

The social interaction between parent and infant is an unique human interchange. Many of the social behaviors performed by parents occur only in the presence of their infants and represent unusual variations of normal adult social behavior (Stern, 1974). Similarly, many of the infant's social behaviors occur only as a response to the novel stimuli provided by the parents. Therefore, the social interactions by parent and infant must be examined in the presence of the other, and in the natural setting of the home, in order that the behaviors of both members can be mutually elicited and maintained. These constraints necessitate the use of an interactive model (Stern, 1974) when the interaction is viewed as a dyadic system in which influences flow in both directions between parent and infant. This study attempts to identify some of the specific interactions between defined parental and infant behaviors in order that this information can increase our understanding of the parent-infant interactive relationship.

In an interaction study those behaviors that each parent and the infant bring to the interaction process and the behaviors that are elicited during the interaction are observed and described. This procedure enables one to consider both parent and child characteristics and their

effects (Bell, 1971). A major goal in this type of research is to show how the mutually elicited behavior of each member influences the behavior of the other member, and to relate this to developmental trends. More specifically, the aim of this research was to investigate the qualitative (attachment vs. affiliative relationships) and the quantitative (frequency and duration of behavior) differences between the mother-infant and father-infant interaction processes with 8-month-old infants, and to determine the effect of their differential responsiveness on behavior. An ethological observation was used to assess the effects of infant characteristics on adult behaviors, and the mutual giving and receiving of reinforcement which lead to parent-infant reciprocal interactions.

Dynamics of Parent-Infant Interaction

Recently, there has been a shift in focus in parent-infant research from an unidirectional approach to a bidirectional approach (e.g., Als & Lewis, Note 1; Osofsky, Note 9) in an attempt to clarify the interaction process in which both the parent and infanct elicit from each other response patterns that lead to the development of reciprocity (Bell, 1971). It appears that interactive behaviors are aimed at achieving a gratifying reciprocal adaptation to one another (Stern, 1974), and therefore, strength of attachment ought to influence the responsiveness of the parent-infant inter-

action (Wigert & LaVoie, Note 11) since attachment implies the formation of a social bond. With the recent impetus in infant research, developmental psychologists are becoming increasingly aware of the fact that the young infant is more capable of organized responses (Bell, 1971; Stern, 1974). As a result the social interaction between the parent and the infant should be viewed as an unique interchange between two responsive and receptive human beings. In order to understand the attachment behaviors between parent and infant, it seems necessary to know the idiosyncratic make-up of the dyadic system in which these bidirectional influences operate (Stern, 1974). Parent and child form a social system, and in such systems it is expected that each participant's responses function as stimuli for the other. Therefore, predictions about interaction contingencies differ, depending on whether the child or the parent is expected to initiate the interaction (Bell, 1971).

Sex differences are quite evident in the parent-infant literature. Lewis and Lee-Painter (1974) reported that male infants tend to vocalize more when they are interacting with an adult. In an earlier study, Moss (1967) showed that mothers behave differently towards male and female infants, and Thoman, Leiderman and Olson (1972) have suggested that differences in maternal treatment as a function of the sex of the infant, start right after birth. Lewis (Note 7)

found differential maternal responsiveness as a function of the sex of the infant, with more vocalization to girls, but more frequent holding of boys. According to Korner (1974) mothers are more responsive to the requests of the infant, whereas fathers respond more to play behavior. Lamb (Note 6) reported that infats' response to play with fathers was significantly more positive than with the mother, this occured because fathers engaged the infants in more physically stimulating play. Most fathers picked up their infants to play with them, not to perform caretaking functions. The prominence of play in the father-infant interaction contrbitue to the view that the father is a person with whom the infant interacts in a pleasurable, varied and unpredictable fashion.

It would appear that the infant's biological sex as well as sex-role expectations by parents influence parental behavior. Olley (Note 8) has suggested that differential parent behaviors seem to be in response to subtle sex differences in the infants. Thus, sex of the participants seems to be an important determinant of the parent-infant interaction process (Moss, 1967). Apparently, interaction in a social situation alters the nature of the individual's responsiveness, both qualitatively and quantitatively. Bell (1971) has stated that the interaction sequences has the qualities of a well practiced game, with each partici-

pant alternating as a stimulus to the other's response. Furthermore, attachment is viewed as the basis of an affectional relationship and initiates an ongoing social interaction process (Ainsworth, 1964).

The manner in which parents play with their children, and the type of instructions they employ in interacting with their children have a significant impact on the child's development of his/her "plan of action" for interacting with the external environment (Kaye, Note 3). Bruner (1973) has proposed that infant skills develop from a combination of subroutines of activities or actions which are instigated by parental initiation. According to Bruner, the intention that guides action also guides learning. The adaptive use of old means for new ends enables even the young infant to accomodate his/her skills to environmental needs, without waiting for gradual selective effects of reinforcement. In responding to this idea about the role of instructions in facilitating the development of a skill, Kaye (Note 3) has suggested that the teacher must take account of the learner's intrinsic motivation, his/her hierarchical skills, and the difficulty of the task to be learned. Following Kaye's line of reasoning, an assessment of parental teaching strategy was included in this study to examine how parents teach their 8-month-old infants. As emphasized by Cohen (1974), this age period is an important period in development be-

cause the infant is now capable of goal-directed and goal-attainment behaviors. Infants at 8-months of age engage in focused interaction with parents in playful behavior as well as in "social games" and the influence of the parent is quite pronounced since the infant is capable of initiating parental actions. Whether this infant behavior is the result of Skinner's concept of progressive approximation as a result of reinforcement, or Tolman's concept of a cognitive map, is not the focus of this discussion. Rather, the important point is that the early cognitive development of the infant is greatly influenced by the teaching behavior of the parent (Kaye, Note 3) and the typical responses of the parent-infant relationship in a specified task situation.

One of the major problems cited in the attachment literature is the lack of an adequate operational definition. Schaffer and Emerson (1964) used degree of separation protest as their measure of intensity of attachment. But Ainsworth (1964) has argued that separation protest is more characteristic of the insecurely attached infant. Other researchers (e.g., Spelke, Zelazo, Kagan & Kotelchuck, 1973) feel that protest to separation is a complex phenomenon influenced by discrepancy, temperment, and level of cognitive development, and therefore, is not a sensitive indicator of the intensity of the child's emotional bond to his parent. Spelke et al. (1973) argue that separation protest occurs when the child is mature enough to generate hypotheses

about the location of his/her caregiver, but not mature enough to resolve the conflict. Cohen and Campos (1974) suggest that differential proximity seeking behavior and eye contact with a stranger from a "secure base" are more valid measures of attachment. According to Ainsworth (1973), selective responding should be considered a necessary, but not sufficient, condition for the demonstration of attachment. Ainsworth, Bell and Stayton (1972) reported that the attached child was more likely to initiate being picked up by the caregiver and to enjoy close proximity to the caregiver. For a given behavior to be considered an index of attachment it must promote proximity to the attachment figure (Ainsworth, 1973; Cohen & Campos, 1974) and demonstrate selective responding (Cohen, 1974).

Attachment, whether defined by maintenance of proximity to caregiver (Bowlby, 1969), proximity seeking (Cohen & Campos, 1974) or more generally as a focused social relationship, has been considered important for several reasons. Ainsworth and Bell (1970) have demonstrated that the quality of the infant attachment reflects different styles of infant social development. Attachment is a social behavior which results in the formation of a discriminating, differential and affectional relationship with a person and which tends to evoke a response from that person. This social response initiates a chain of interactions which werve to consolidate

the affectional relationship (Ainsworth, 1964).

According to Bowlby (1969), attachment behavior has biological underpinnings which can be comprehended only within a developmental context. For attachment to occur, the infant must be capable of goal-directed responses (Bowlby, 1969). The onset of goal-directedness appears at 7-9 months, suggesting this age to be critical to the formation of attachments (Tulkin & Kagan, 1972). Based on this position, and findings by Lamb (Note 6) that 8-month-old infants are engaging in attachment behaviors with their parents, it would seem important to investigate the effect of attachment on the responsiveness and quality of the interaction between mother-infant and father-infant. Since Lewis, Weinraub and Ban (Note 7) found that proximity seeking was a good assessment of differential responsiveness, this behavior must be considered in the assessment of interactional differences.

The Role of the Father

Assessment of the infant's attachment to its mother has been a topic of considerable interest among developmental psychologists in recent years (Ainsworth, 1973), but the nature of the relationship between the infant and the father has been given little attention (Kotelchuck, Note 4; Lamb, Note 6). To understand the composition of the nuclear family and the socialization process, Lamb argues that we need

to expand our research efforts to increase our understanding of the dynamics involved in interactions between father and infant. According to Kotelchuck (Note 4) the father is an important figure in the child's life, especially in introducing the child to the world beyond the home. Kotelchuck has shown that the father's relationship with the infant is an affiliative one, in which the father spends more time taking the infant into the special world than does the mother. Fathers introduce their children to games, rules, and other social interactions.

Since the father is an attachment figure (Cohen & Campos, 1974) and there are both qualitative and quantitative differences between mother-infant and father-infant relationships (Lamb, Note 5), it seems necessary to explore the nature of the father-infant relationship. Further, Ban and Lewis (1974) observed that attachment behavior directed toward the father is different from that directed toward the mother, and the expression of attachment seems to be a function of the sex of infant - sex of parent pairing. However, Lamb (Note 6) found no evidence that mothers are preferred to fathers as the attachment figure in his sample of 8-month-old infants. The absence of data on the role of the father has been noted by Parke and Sawin (Note 10) who stress the need for research on the father-infant relationship to determine the father's role in the development of attachment

behaviors, and in the social development of the child. Researchers and theorists realize most infants grow up in the context of the family, in which there are other persons - fathers and siblings - to whom infants become attached and who conceivably play important roles in socialization (Lamb, 1975a). Lamb (1977) has suggested that we distinguish attachment and affiliative behavioral systems. Both theoretical and empirical considerations suggest that there are certain behaviors that infants direct almost exclusively to attachment figures, whereas there are other behaviors that are directed not only to attachment figures, but also to other friendly adults. These are the affiliative behaviors.

Lamb (1977) found that affiliative behaviors were directed toward fathers far more often than to mothers. In addition, any infant preference expressed toward a significant adult was expressed in the differential display of the attachment, rather than the affiliative behaviors. In the analysis of infant behaviors, Lamb (1976b) found that infants showed a significant preference for the father over the mother and visitor. Mother was preferred to the visitor. Although fathers were preferred to mothers across all measures, the analysis showed that the preference was accounted for largely by vastly more affiliative interaction with fathers. On those measures that are most clearly related to the attachment behavioral system, the parents are not

differentiated. Infants seem to relate to mothers and fathers in different ways. Lamb (1977) concluded that infants are not "more attached" to their fathers than to their mothers, but rather they are attached to both parents. However, when both persons are present, fathers are more salient persons than mothers. It appears that the mother-infant and father-infant relationships involve different kinds of experiences for the infants.

On the basis of presently available evidence (Cohen & Campos, 1974; Lamb, 1977) it is possible to conclude that infants are attached to both parents from the beginning of attachment relations and that, the nature of the mother-infant and father-infant interaction differs qualitatively and consistently.

Aim of the Study

The aim of this study was to: (a) assess the qualitative and quantitative differences between the mother-infant and father-infant interaction relationships with 8-month-old infants; (b) to determine which participant's responses seem to be stimuli for the other's subsequent behavior; (c) to ascertain whether sex of parent and/or sex of child has any differential effects on the behaviors exhibited; and (d) to observe the effect of attachment behaviors on the responsiveness of the parent-infant interaction.

It was predicted that (1) regardless of sex, infants

do not show a preference for either mothers or fathers. However, the nature of the mother-infant and father-infant interactions were expected to differ both qualitatively and quantitatively, with the father-infant interaction involving more physical stimulation and playful behavior, leading to a generally pleasurable interaction. Therefore, (2) infants should smile to and vocalize to fathers more than to mothers, whereas the infants should seek to be held by, fuss to and touch their mothers more often than their fathers. It was also predicted that (3) the infants will engage in more distal interaction with fathers, while engaging in proximal interaction with the mothers. Fathers were expected (4) to hold their infants in a playful manner, while mothers were expected to engage in caretaking holds.

Chapter II

METHOD

Subjects

The subjects were 10 male and 10 female 8-month-old infants (M = 8 mos., 6 day; R = 7.28 - 8.15; SD = 5) and their parents. All infants were white, first-borns from middle-class families, as determined by the Warner, Meeker and Eells (1964) occupational rating scale (M = 1.3; SD = .68). The average age of the mothers was 24.8 years (R = 20-34; SD - 3.7), with a mean educational level of 13.6 years (R = 11-18; SD = 2.32). The average age of the fathers was 26.8 years (R = 22-35; SD = 3.1), with a mean educational level of 14.5 years (R = 12-20; SD = 2.6).

Mothers had a mean I.Q. of 114.5 (R = 104-145; SD = 12.6) which was similar to the fathers I.Q. of 112.5 (R = 98-146; SD = 10.6) as measured by the Peabody Picture Vocabulary Test. The cognitive level of each infant was assessed by the Bayley Scales of Infant Development. The mean M.D. of the female infants was 107 (R - 97-123; SD = 8.7) and the mean M.D. of the male infants was 105 (R = 96-122; SD = 9.9).

Observations of Parent-Infant Interaction Sequence

Mother-infant, father-infant and mother-infant-father interaction sequences were observed and recorded in two

separate 30 minute sessions for each situation. The observations of interactive behavior occured in the family room or in the play area of the home. An Esterline-Angus 20 Channel Event Recorder was used to record the various observations. The observer was situated in a location in the room which provided an unobstructed view and evaluation of the parent-infant interaction sequences. This procedure enabled the sampling of typical interaction.

A second observer accompanied the primary observer on 5 visits to different homes in order to obtain simultaneous and independent recordings of the interactions to use in a computation of inter-observer reliability.

Description of the Measures

Attachment behaviors. The triadic interaction involving both parents and the infant was observed on the first visit. The observer(s) recorded the infant's behavior and the parent to which each particular behavior was directed. The recorded infant behaviors were 1. smiling to, 2. vocalizing to, 3. looking at, 4. laughing at, 5. touching, 6. reaching to, and 7. proximity seeking with respect to a parent.

The dyadic interactions with mother-infant and father-infant were recorded on the second visit. The observer(s) recorded the infant's behavior and the contingent behavior of the parent present for 30 minutes noting each time a

particular behavior was directed to the parent. The recorded infant behaviors consisted of 1. smiling to, 2. vocalizing to, 3. looking at, 4. laughing at, 5. touching, 6. reaching to, and 7. proximity seeking. Parental behaviors were 1. vocalizing to, 2. smiling to, 3. looking at, 4. touching, 5. giving objects/toys, and 6. physical stimulation with respect to the infant. These behaviors were selected because they demand minimal inferential decision making on the part of the observer, and the behaviors appear to be involed in the formation of attachment (Ban & Lewis, 1974; Cohen & Campos, 1974; Lamb, Note 5). A code was assigned to each behavior, and these codes were scored for frequency and duration, as well as for sequential ordering (directionality) of behaviors as they occured in the interaction relationship. The sequences of the mother-infant and father-infant interaction sequences were counter-balanced across the two visits.

In addition to the observation and recording of the interactional relationships, three task situations were used to assess differential responsiveness.

Proximity seeking. In this task, infants were tested with each parent separately in a proximity-seeking and proximity-maintaining situation. The parent was asked to place the infant in the middle of the room and situate herself/himself 10 feet from the infant. Time to locomote to within

three feet proximity, as well as time spent in proximity, was recorded. Since Cohen and Campos (1974) found this task to be a good discriminator of intensity of attachment, proximity seeking and selective responding were used as the measures of attachment between parent and infant. Infants were categorized as securely attached, insecurely attached, or in transition, based on the following criteria: (1) The infant locomotes to the parent rather than to the observer; (2) The amount of time spent in proximity-seeking and proximity maintaining. Cohen and Campos (1974) have suggested that infant locomotion to the parent in less than 60 seconds indicates a secure attachment. Infants also were judged as securely attached if they engaged in eye contract with the stranger (observer) when they were within three feet proximity of the parent.

Selective responding. For this measure the parents were asked to situate themselves in the room so that they were approximately 10 feet apart. The infant was placed in the center of the room and the observer(s) recorded the parent to which the infant locomoted. Three repetitions were used for this task. The selective responding and proximity-seeking tasks were used to assess security of attachment.

Holding behavior. Each parent was asked to hold the infant for one minute in a manner which was typical of her/his usual holding behavior. The infant's response to the

hold was scored according to the following criteria:

1. Fussing or crying
2. Facial expressions indicated a readiness to cry
3. Eye contact
4. Smiling and/or positive vocalization
5. Laughing or giggling

The type of parent hold was classified according to one of following categories:

1. Caretaking/soothing--talking to the infant, caressing and/or stroking
2. Playful--bouncing the infant, laughing at, positive stimulation
3. Discipline--instructing the infant through physical manipulation to remain calm; scolding for crying or "bouncing around".

Teaching strategies. This task provided a measure of the process of behavioral interaction--an interaction where one partner is the instructor and the other the learner (Kaye, 1975). Parents were asked to teach their child how to retrieve a toy (a squeaky rubber toy) from behind a barrier (a cardboard box). The infant was placed in the parent's lap in front of the barrier so that the infant's eyes were just above the top of the barrier. The teaching strategy used by the parent was scored according to the following: (1) verbal instructions: telling the infant to

retrieve the toy; (2) modeling: parent retrieving toy and replacing it; (3) modeling and verbalizing; or (4) prompting; moving the baby's hand and/or arm.

Cognitive ability. Each infant was administered the Bayley Scale of Infant Development. Each parent was given the Peabody Picture Vocabulary Test.

Scoring of Interaction Data

Three graduate students were recruited to assist the researcher in the scoring of the interaction tapes and data reduction. Each coded behavior was scored for frequency and duration of occurence across the 30 minute recorded sessions. In addition, the tapes were scored for behavior by behavior interaction sequences from parent-to-infant and infant-to-parent (see Appendix A). The reduced data was transferred to computer cards for computer processing.

Reliability of Observations

Inter-rater reliability averaged 91%, ranging from 71% to 97% agreement on the observed interaction sequences and from 98% to 100% agreement on the attachment and teaching strategy measures. Inter-scorer reliability of the interaction tapes was assessed and averaged 99.7% agreement, ranging from 97% to 100% agreement.

Chapter III

RESULTS

The interaction consisted of 110 infant and parental behavior variables and Pearson correlations were computed for each of the variables in the study. The frequency and duration of each coded behavior, as well as the task situation and test scores, served as distinct variables. The correlations relevant to the hypothesis are presented in Tables 1 to 6.

Correlations of Mothers' and Fathers' Responses

Correlations between mothers' and fathers' responses to their infant are present in Table 1. The significant correlations showed that mothers and fathers respond with similar frequencies when vocalizing to, looking at, smiling at, and holding their female infant. When in interaction with their male infant, parents respond with a similar frequency when vocalizing to, looking at, smiling at, physically stimulating and giving objects to their infant son (see Table 1). The durations of certain mother and father responses were also correlated. The significant correlations include looking at female infants, holding female infants, and holding male infants. The correlation patterns, based on parental responding, are very similar for both male and female infants.

TABLE 1

Correlations of Mother and Father Responses to Their Infant on Measures of Frequency and Duration

Parental Response	Sex of Infant	
	Female	Male
Frequency of Vocalization	.56**	.88**
Duration of Vocalization	-.02	-.07
Frequency of Looking	.42 *	.47 *
Duration of Looking	.45 *	.24
Frequency of Smiling	.44 *	.67**
Duration of Smiling	.37	.37
Frequency of Holding	.49 *	-.24
Duration of Holding	.41 *	.88**
Frequency of Physical Stimulation	.30	.45 *
Duration of Physical Stimulation	-.12	-.06
Frequency of Giving Objects	.56**	.44 *
Duration of Giving Objects	.31	.35
Frequency of Punishment	.00	-.24
Duration of Punishment	.05	-.23

df = 18

*c.v. .05 = .44

**c.v. .01 = .56

Correlations of Infant Behaviors in the Dyad and Triad Setting

Comparisons between infant responses to their parents behavior in a dyad relationship (infant and parent) and in a triad relationship (infant and both parents) are presented in Tables 2 and 3. Dyad and triad correlations for the female infant appear in Table 2, while those for the male infant appear in Table 3. As noted in Table 2, infant daughters reaching to mothers in the dyad and triad are negatively correlated, showing that with an increased frequency

TABLE 2

Correlations of Female Infant Behavior with Mothers and Fathers in the Dyad and Triad Setting

Female Infant Response	Parent	
	Mother	Father
Frequency of Vocalizing	.12	.20
Frequency of Looking	-.09	.24
Frequency of Smiling	.11	-.07
Frequency of Touching	.53	-.29
Frequency of Reaching To	-.57	.20
Frequency of 3' Proximity	.03	.16
Frequency of Laughing	.01	.35
Frequency of Crying	.61 *	.10

df = 9

c.v. .05 = .60

of reaching to the mother in one setting, there is a corresponding decrease of reaching in the other setting. However, crying to mothers is quite similar in both settings. The change from a dyad setting to a triad setting seems to influence the female infant's response to her father more extensively than the female infant's response to her mother. None of the correlations of responses in the dyad and triad setting were significant for female infants responding to their fathers. The correlations for male infants which appear in Table 3 indicate that infant behaviors in the dyad setting are significantly correlated with those in the triad setting when the male infant looks at, seeks proximity to or crys to his mother. Male infant behavior to the fathers in

TABLE 3

Correlations of Male Infant Behavior with Mothers and Fathers in the Dyad and Triad Setting

Male Infant Response	Parent	
	Mother	Father
Frequency of Vocalizing	.49	.34
Frequency of Looking	.60 *	.73
Frequency of Smiling	.40	.33
Frequency of Touching	.09	.54
Frequency of Reaching To	-.39	.36
Frequency of 3' Proximity	.60 *	.84
Frequency of Laughing	.23	.18
Frequency of Crying	.74**	.06

df = 9

*c.v. .05 = .60

**c.v. .01 = .73

the dyad and triad is similar for looking at and seeking proximity to.

Parent-Infant Correlations Within the Triad

Correlational analyses of infant behavior in the triad setting were performed to ascertain differential responding as a function of the sex of infant and sex of parent pairing. The correlations, presented in Table 4, suggest that male and female infants seem to respond differently to parents. Correlations of female infant-mother and female infant-father responses are significant for: infant vocalizing to, reaching to, looking at, touching, seeking proximity to, and laughing at. Apparently female infants show no parental pre-

TABLE 4

Correlations of Infant Behavior with Father and Mother in the Triad Setting

Infant Behavior	Sex of Infant	
	Female	Male
Frequency of Vocalizing	.87**	.38
Frequency of Looking	.61 *	.24
Frequency of Smiling	-.30	.53
Frequency of Touching	.83**	-.14
Frequency of Reaching To	.89**	-.29
Frequency of 3' Proximity	.66 *	.48
Frequency of Laughing	.79**	.39
Frequency of Crying	.40	-.08

df = 9

*c.v. .05 = .60

**v.c. .01 = .73

ference when responding in the triad. However, infant sons apparently respond in a different manner to mothers and fathers. No significant correlations appeared for the observed behaviors. The correlation patterns on this measure are quite different for male and female infants. Female infant responses to the mother are highly correlated with female infant responses to the father. Male infants responses to the mother and to the father are not significantly correlated in the triad setting.

Frequency and Duration of Male and Female Infant Behaviors

Each infant coded behavior was scored for both the frequency and duration of occurrence. Pearson correlations

for these values of infant behavior are shown in Table 5.

TABLE 5

Correlations of Frequency and Duration of Female and Male Infant Behaviors with Mothers and Fathers

Infant Behaviors	Female Infant		Male Infant	
	Mother	Father	Mother	Father
Vocalizing	-.34	-.33	-.01	.61
Looking	-.60 *	-.42	-.54	-.35
Smiling	-.54	-.17	-.09	.14
Touching	.04	.42	-.52	.32
Reaching To	.20	.27	-.09	.23
3' Proximity	-.83**	.10	-.17	-.40
Laughing	.60 *	-.22	-.00	-.10
Crying	.84**	.34	-.17	.15

df = 9

*c.v. .05 = .60

**c.v. .01 = .73

The significant correlations between the frequency and duration for female infants to mother are: looking at, seeking proximity to, laughing at, and crying to. A similar analysis for fathers indicated that there were no significant correlations on this measure. The responses of the male infants to their mothers yielded no significant correlations between frequency and duration. In the male infant-to-father interaction sequence, the only significant correlation was that for vocalizing to. Generally, these results indicate that there is little or no relationship between the frequency and duration of infant responses.

Parent Behavior Toward Male and Female Infants

Correlations between the frequency and duration of each of the coded parent behaviors are presented in Table 6. Mother-female infant pairings show the following significant

TABLE 6

Correlations of Frequency and Duration of Maternal and Paternal Behaviors Toward Male and Female Infants

Parent Behaviors	Maternal Behavior		Paternal Behavior	
	Female	Male	Female	Male
Vocalizing	-.16	-.32	.60 *	-.52
Looking	-.77**	-.63 *	-.64 *	-.80**
Smiling	.01	.33	.29	.45
Holding	-.79**	.15	-.35	.30
Stimulation	-.78**	-.69 *	-.15	-.41
Giving Objects	-.22	-.68 *	.38	-.40
Punishment	1.000**	.94**	.94	.94**

df = 9

*c.v. .05 = .60

**c.v. .01 = .73

relationships between the frequency and duration of maternal behavior: looking at, holding, physical stimulation and punishment. Mother-infant son correlations were significant for frequency and duration of looking at, physical stimulation, giving objects to and punishing. The father-female infant analysis showed significant relationships for: vocalizing to, looking at and punishing. Similar analysis for father-male infants indicated the following significant

correlations: looking at and punishing. These results indicate that for a substantial number of parental behaviors, there is a significant relationship between the frequency and duration of the response. This finding is in contrast to the preceding finding concerning infant responses.

Sex of Infant Differences

Sex of the infant seems to be a significant factor in the dyadic parent-infant interaction process. Therefore, t-tests were performed on all attachment variables to ascertain differences as a function of infant sex. Table 7 represents the means and standard deviations for those behaviors which were significantly different. Significant sex differ-

Table 7

Means and Standard Deviations of Sex Differences in Infant Behaviors

Infant Behavior (Frequency of)	Female		Male	
	M	SD	M	SD
Touching Mother	3.80	3.05	19.50	11.71
Reaching to Mother	4.50	3.24	14.30	8.88
Crying to Mother	2.10	2.08	4.80	3.43
Attention to Observer	19.50	8.63	34.30	17.30
Vocalizing to Father	20.00	8.92	32.20	10.29
Looking at Father	41.70	13.19	61.00	14.03
Touching Father	5.40	5.72	14.50	8.26

df = 18

were present for reaching to mother, t (18) = 3.28, $p<.01$, touching mother, t (18) = 2.50, $p<.05$, crying to mother, t

(18) - 2.13, $p<.05$, attention to observer, t (18) = 2.42, $p<.05$, vocalizing to father, t (18) = 2.83, $p<.05$), looking at father, t (18) = 3.17, $p<.01$, and touching father, t (18) = 2.86, $p<.01$. In all of the above cases, the mean frequency was greater for males than for females, indicating that for these behaviors male infants are more responsive in the dyad setting than female infants. This is not true in the triad setting, as will be discussed later.

Interactional Analysis in the Parent-Infant Dyad

The specific interaction sequences of the parent-infant and the infant-parent dyadic relationship processes were analyzed by use of the Markov interactional analysis to detect specific chains of behavior and conditional probabilities for each of the coded interaction behaviors. The results of the parent-to-infant interaction sequences appear in Tables 8 to 11.

Mother- female infant dyad.

Table 8 shows the conditional probability for each of the specific responses of the female infant to the specific stimulus behavior of their mother. Some of the most evident chains of behavior are as follows. Given that the mother vocalizes to the female infant, the probability that the infant will respond by vocalizing is (.26); looking (.26); smiling (.07); touching (.05); moving to within three feet proximity (.13); laughing (.04); crying (.00); and respond-

TABLE 8

Matrix of Conditional Probabilities for Female Infant Responses to Maternal Behavior

	Female Infant Response									
Maternal Behavior	Vocalizing	Looking	Smiling	Touching	Reaching To	3' Proximity	Laughing	Crying	Responding to Observer	Frequency Totals
Vocalizing	.26	.26	.07	.05	.06	.13	.04	.00	.13	904
Looking	.37	.27	.06	.01	.04	.05	.02	.04	.14	988
Smiling	.42	.24	.04	.04	.01	.07	.01	.01	.16	20
Holding	.25	.25	.15	.25	.00	.00	.10	.00	.00	240
Physical Stimulation	.24	.24	.30	.00	.00	.05	.01	.01	.15	88
Giving Objects	.10	.25	.05	.10	.25	.05	.00	.15	.05	188
Punishment	.00	.50	.00	.00	.00	.00	.00	.50	.00	2
Frequency Totals	772	705	376	24	28	168	68	53	236	2430

ing to the observer (.13). For the majority of maternal behaviors, vocalizing or looking by the female infant are the most probable behaviors. The most likely female infant response for each maternal behavior is as follows: M-vocalizing--I-vocalizing or looking; M-looking--I-vocalizing; M-smiling--I-vocalizing; M-holding--I-vocalizing, looking or touching; M-physical stimulation--I-smiling; M-giving ob-

jects--I-looking or reaching to; M-punishment--I-looking or crying. Responses of laughing, crying or touching by the female infant are least likely to follow a maternal behavior.

Mother-male infant dyad. The matrix of conditional probabilities for the mother-male infant interaction process is presented in Table 9. Many of the probability relationships are similar to that for the mother-female infant dyad.

TABLE 9

Matrix of Conditional Probabilities for Male Infant Responses to Maternal Behavior

	Male Infant Response									
Maternal Behavior	Vocalizing	Looking	Smiling	Touching	Reaching To	3' Proximity	Laughing	Crying	Responding to Observer	Frequency Totals
Vocalizing	.43	.29	.04	.08	.02	.04	.00	.00	.10	1088
Looking	.32	.36	.12	.01	.01	.05	.03	.04	.06	820
Smiling	.31	.28	.14	.00	.01	.07	.07	.02	.10	20
Holding	.25	.25	.10	.05	.05	.00	.20	.00	.10	280
Physical Stimulation	.23	.15	.32	.00	.03	.06	.06	.00	.15	80
Giving Objects	.41	.09	.18	.00	.00	.22	.00	.00	.10	292
Punishment	.00	.00	.00	.00	.00	.00	.00	1.00	.00	1
Frequency Totals	836	640	236	80	80	180	56	93	380	2581

Vocalizing and looking are the most probable male infant responses for most maternal behaviors. The most likely male infant response for each maternal behavior is: M-vocalizing--I-vocalizing; M-looking--I-looking; M-smiling--I-vocalizing; M-holding--I-vocalizing or looking; M-physical stimulation--I-smiling; M-giving objects--I-vocalizing; M-punishment--I-crying. Crying, laughing and touching are among the least probable infant responses.

Father-female infant dyad. The matrix of conditional probabilities for the father-female infant dyad interaction sequences is presented in Table 10. In general, female infants are most likely to respond to the father by vocalizing, looking or smiling. However, some exceptions can be noted. For example, when a father holds his female infant, the most probable response is laughing. The most likely female infant response for each paternal behavior is: P-vocalizing--I-looking; P-looking--I-vocalizing or looking; P-smiling--I-looking; P-holding--I-laughing; P-physical stimulation--I-smiling; P-giving objects--I-smiling; P-punishment--I-looking or response to observer. The least probable infant responses to a father behavior are crying, moving to within three feet proximity, and responding to the observer.

Father-male infant dyad. The matrix of conditional probabilities for the father-male infant interaction sequence is presented in Table 11. The most likely male in-

TABLE 10

Matrix of Conditional Probabilities for Female Infant Responses to Paternal Behavior

Paternal Behavior	Female Infant Response: Vocalizing	Looking	Smiling	Touching	Reaching To	3' Proximity	Laughing	Crying	Responding to Observer	Frequency Totals
Vocalizing	.22	.31	.16	.05	.04	.03	.14	.00	.05	1072
Looking	.35	.35	.14	.02	.04	.02	.04	.00	.04	684
Smiling	.32	.43	.06	.02	.04	.02	.05	.00	.06	24
Holding	.15	.15	.19	.00	.00	.00	.41	.10	.00	244
Physical Stimulation	.09	.20	.35	.11	.11	.01	.09	.00	.04	144
Giving Objects	.08	.05	.47	.17	.08	.00	.13	.00	.02	268
Punishment	.00	.50	.00	.00	.00	.00	.00	.00	.50	2
Frequency Totals	660	760	404	120	132	56	168	2	136	2438

fant response to each paternal behavior is: P-vocalizing--I-looking; P-looking--I-vocalizing or looking; P-smiling--I-looking; P-holding--I-laughing; P-physical stimulation--I-smiling; P-giving objects--I-smiling; P-punishment--I-looking or response to the observer. With the exception of holding, crying is the least likely infant response to all paternal behaviors. It is quite evident from inspection of

TABLE 11

Matrix of Conditional Probabilities for Male Infant Responses to Parental Behavior

Paternal Behavior	Male Infant Response: Vocalizing	Looking	Smiling	Touching	Reaching To	3' Proximity	Laughing	Crying	Responding to Observer	Frequency Totals
Vocalizing	.22	.31	.16	.05	.04	.03	.14	.00	.05	1104
Looking	.32	.32	.14	.02	.04	.02	.04	.00	.04	512
Smiling	.32	.43	.06	.02	.04	.02	.05	.00	.06	20
Holding	.25	.15	.13	.03	.00	.00	.37	.07	.00	140
Physical Stimulation	.09	.19	.33	.12	.12	.02	.09	.00	.04	56
Giving Objects	.08	.05	.47	.17	.08	.00	.13	.00	.02	408
Punishment	.00	.50	.00	.00	.00	.00	.00	.00	.50	2
Frequency Totals	629	668	240	88	104	80	204	96	133	2242

this table of female infant responses that the sequences involved in the father-female infant and father-male infant interaction processes are virtually the same.

Summary of Parent-Infant Interactions

The parent-infant interaction sequences from the dyadic realtionship processes reveal specific conditional probabilities of infant responses, given the parental stimuli, which

are both consistent and predictable. The matrixes in Tables 8-11 reveal specific patterns and clustering of behavior in the parent-infant dyad relationship. In the mother-infant interaction sequences (see Tables 8 & 9), both female and male infant responses cluster around vocalizing and looking as the most frequent and probable responses. The second most probable responses cluster around smiling and response to the observer. These findings are important in that Clarke-Stewart (1973) has shown that the prevalence of the attachment behaviors of vocalizing, looking and smiling are important determinants of infant-parent attachment. A high frequency of these behaviors in the interaction process indicates that attachment is being exhibited. Eye contact with a stranger from a secure base has also been shown to be an indicator of attachment (Ainsworth, 1964).

In the father-infant interaction sequences (see Tables 10 & 11), the most frequent infant responses were also vocalizing and looking, for both female and male infants. The second most probable response-cluster is smiling. These results indicate that the mother-infant and father-infant interaction sequences are quite similar; that is, similar patterning of contingent responses occur in both the mother-infant and father-infant interactive relationships.

The last probable responses in the mother-infant relationship are touching, reaching to, laughing and crying,

whereas the least probable responses in the father-infant relationship are 3' proximity and crying. These results suggest that beyond the responses of vocalizing, looking and smiling, infants respond to mothers with more attachment-type responses, whereas infants respond to their fathers with more affiliative-type responses (Lamb, 1976).

Interactional Analysis in the Infant-Parent Dyad

Tables 12-14 present the results of the Markov interactional process analysis for the infant-to-parent sequences. The conditional probabilities for each of the parent responses following an infant behavior, given the specific stimulus behavior of the infant, appear in the tables.

Female infant-mother dyad. The matrix of conditional probabilities for the female infant-mother interaction sequence is presented in Table 12. Specific chains of behavior and specific conditional probabilities for each of the coded behaviors can be noted. For example, given that the female infant looks at the mother, the probability that the mother will respond by vocalizing is (.47); looking (.36); smiling (.01); holding (.08); physical stimulation (.04); giving objects (.04); and punishing (.00). Across all female infant behaviors, vocalizing and looking are the most probable maternal responses. The most likely maternal response to each stimulus behavior of the female infant is as follows: I-vocalizing--M-looking; I-looking--M-vocalizing;

TABLE 12

Matrix of Conditional Probabilities for Maternal Responses to Female Infant Behavior

	Maternal Response							
Female Infant Behavior	Vocalizing	Looking	Smiling	Holding	Physical Stimulation	Giving Objects	Punishment	Frequency Totals
Vocalizing	.37	.50	.01	.05	.01	.06	.00	1224
Looking	.47	.36	.01	.08	.04	.04	.00	873
Smiling	.44	.31	.01	.16	.03	.05	.00	620
Touching	.41	.11	.00	.11	.11	.26	.00	68
Reaching To	.25	.50	.00	.25	.00	.00	.00	16
3' Proximity	.33	.39	.00	.07	.09	.12	.00	216
Laughing	.16	.54	.00	.15	.05	.10	.00	76
Crying	.40	.53	.00	.00	.04	.04	.01	92
Response to Observer	.37	.43	.03	.05	.01	.00	.00	316
Frequency Totals	1384	1420	32	300	120	244	1	3501

I-smiling--M-vocalizing; I-touching--M-vocalizing; I-reaching to--M-looking; I-3' proximity--M-looking; I-laughing--M-looking; I-crying--M-looking; I-response to observer--M-looking. Among the least probable maternal responses are smiling, physical stimulation and punishment.

Female infant-father dyad. The matrix of conditional probabilities for the female infant-father interaction sequence is presented in Table 13. The most probable paternal

TABLE 13

Matrix of Conditional Probabilities for Paternal Responses to Female Infant Behavior

	Paternal Response							
Female Infant Behavior	Vocalizing	Looking	Smiling	Holding	Physical Stimulation	Giving Objects	Punishment	Frequency Totals
Vocalizing	.55	.31	.03	.04	.00	.07	.00	920
Looking	.59	.28	.02	.06	.01	.04	.00	698
Smiling	.40	.20	.03	.28	.01	.08	.00	596
Touching	.39	.22	.02	.12	.08	.17	.00	232
Reaching To	.30	.15	.03	.30	.15	.07	.00	104
3' Proximity	.33	.16	.03	.12	.16	.20	.00	106
Laughing	.37	.32	.02	.06	.06	.16	.01	172
Crying	.66	.33	.01	.00	.00	.00	.00	12
Response to Observer	.45	.42	.04	.02	.00	.07	.00	168
Frequency Totals	1460	824	14	352	84	272	2	3006

response to each behavior of the female infant is: I-vocalizing--P-vocalizing; I-looking--P-vocalizing; I-smiling--P-

vocalizing; I-touching--P-vocalizing; I-reaching to--P-holding or vocalizing; I-3' proximity--P-vocalizing; I-laughing--P-vocalizing; I-crying--P-vocalizing; I-response to observer--P-vocalizing. For each stimulus behavior of the female infant the most probable response of the father is that of vocalizing. Among the least probable responses are those of smiling and punishment, with punishment occuring in only one cell-response to crying with a probability of .01.

Male infant-mother dyad. The matrix of conditional probabilities for the male infant-mother interaction sequence is presented in Table 14. The most probable maternal response to each stimulus behavior of the male infant is as follows: I-vocalizing--M-vocalizing; I-looking--M-vocalizing; I-smiling--M-vocalizing; I-touching--M-vocalizing; I-reaching to--M-looking; I-3' proximity--M-looking; I-laughing--M-vocalizing; I-crying--M-vocalizing; I-response to observer--M-vocalizing. For each of the stimulus behaviors of the male infant, the most probable response of the mother is vocalizing or looking, with the exception of two cases (reaching to and 3' proximity). Punishment was one of the least probable responses. But, among all the interaction sequences, the response of punishment has its highest probability in the male infant-mother sequence. (.05 probability as a response to crying).

TABLE 14

Matrix of Conditional Probabilities for Maternal Responses to Male Infant Behavior

	Maternal Response							
Male Infant Behavior	Vocalizing	Looking	Smiling	Holding	Physical Stimulation	Giving Objects	Punishment	Frequency Totals
Vocalizing	.44	.40	.04	.08	.01	.03	.00	1048
Looking	.46	.26	.03	.10	.04	.11	.00	904
Smiling	.45	.22	.02	.21	.02	.08	.00	340
Touching	.44	.24	.03	.03	.13	.13	.00	116
Reaching To	.44	.56	.00	.00	.00	.00	.00	44
3' Proximity	.29	.48	.03	.04	.07	.09	.00	164
Laughing	.30	.30	.02	.00	.04	.34	.00	92
Crying	.65	.08	.07	.00	.09	.06	.05	129
Response to Observer	.42	.34	.01	.08	.04	.11	.00	436
Frequency Totals	1448	1080	8	308	132	292	1	3273

Male infant-father dyad. The matrix of conditional probabilities for the male infant-father interaction sequence is presented in Table 15. Vocalizing is the most probable response to each stimulus behavior of the male infant, with the exception of infant laughing, where giving

TABLE 15

Matrix of Conditional Probabilities for Paternal Responses to Male Infant Behavior

Male Infant Behavior	Paternal Response: Vocalizing	Looking	Smiling	Holding	Physical Stimulation	Giving Objects	Punishment	Frequency Totals
Vocalizing	.67	.23	.01	.04	.02	.03	.00	1180
Looking	.50	.30	.02	.07	.03	.08	.00	792
Smiling	.48	.22	.03	.16	.01	.10	.00	264
Touching	.40	.38	.02	.02	.06	.12	.00	196
Reaching To	.61	.38	.01	.00	.00	.00	.00	52
3' Proximity	.45	.18	.00	.05	.14	.18	.00	108
Laughing	.21	.26	.03	.07	.01	.42	.00	256
Crying	.63	.12	.01	.00	.15	.09	.00	142
Response to Observer	.46	.29	.06	.07	.03	.14	.00	228
Frequency Totals	1732	844	10	192	104	336	0	3218

objects is the most probable response. The response probabilities for paternal looking and vocalizing are quite high across all stimulus behaviors. There were no recorded instances of father punishing the male infant. Smiling and physical stimulation were also low probability responses.

Summary of Infant-Parent Interaction

The infant-parent interaction sequences from the dyadic relationship processes reveal specific conditional probabilities of parent responses, given the infant stimuli, which are both consistent and predictable. The matrixes in Tables 12-15 reveal specific patterns and clustering of behavior in the infant-parent dyad relationship. In the female infant-parent interaction sequences (see Tables 12 & 13), the most probable parental responses cluster around vocalizing and looking. The second most frequent or probable parental responses are those of holding and giving objects to the infant. The least probable parental responses are those of smiling and punishment. These results are true for both the female infant-mother and the female infant-father interaction sequences. Across all infant stimulus behaviors, vocalizing is the most frequent parental response, whereas punishment is the least.

The matrixes of the male infant-parent interaction sequences are presented in Tables 14 & 15. In both the male infant-mother and the male infant-father sequences, vocalizing and looking cluster together as the most frequent and probable parental responses. The second most probable response group includes holding and giving objects. In both sequences, smiling and punishment are the least frequent parental responses to the stimulus behaviors of the male in-

fant.

The infant-parent interaction sequences yield similar conditional probabilities, regardless of the sex of infant-sex of parent pairing. In comparing the parent-infant and the infant-parent interaction sequences, it is evident that the interaction processes are quite systematic, consistent and predictable, and that the relationship between infants and their parents are reciprocal in nature; that is, each participant influences the responding of the other.

Infant Behavior in the Triad

The infant behaviors in the triad setting were recorded and scored for frequency of occurence and parent to whom directed. The mean frequencies for the various infant behaviors are presented in Table 16. A repeated measure analysis of variance, with infant behaviors as the repeated measure factor, was performed on the parent-infant interaction data from the triad setting to examine differences in the rates of infant behaviors as a result of sex of parent, sex of infant, or the sex of parent-sex of infant pairing. The summary table for this analysis appears in Table 17. The significant effect for infant behavior indicates differences in the frequencies of emitted behavior in the triad setting. Further, both sex of infant and sex of parent were significant factors. However, the Sex of Parent x Sex of Infant interaction was not significant, indicating that the fre-

TABLE 16

Mean Frequencies for the Nine Infant Behaviors in the Triad Setting

Infant Behavior	Mother			Father		
	Female Infant	Male Infant	Combined	Female Infant	Male Infant	Combined
Vocalizing	40.80	30.30	35.55	32.20	20.00	26.09
Looking	52.00	42.10	47.05	61.00	41.70	51.35
Smiling	11.50	11.00	11.25	7.70	7.20	7.45
Touching	19.50	3.80	11.65	14.50	5.40	9.95
Reaching	14.30	4.50	9.40	8.30	3.00	5.65
Proximity	8.50	11.90	10.20	9.30	7.60	8.45
Laughing	5.80	1.80	3.80	5.30	3.30	4.30
Crying	4.80	2.10	3.45	3.20	2.20	2.70
Response to Observer	16.60	21.60	19.10	7.40	10.30	8.85

TABLE 17

Analysis of Variance Summary for Frequency of Infant Behavior in the Triad

Source	df	SS	MS	F	P<
Sex of Infant (SI)	1	2,397.32	2,397.32	8.72	.01
Error	18	4,946.28	274.79		
Sex of Parent (SP)	1	789.14	789.14	6.31	.05
SP X SI	1	3.40	3.40	.03	
Error	18	2,252.06	125.11		
Infant Behaviors (IB)	8	72,790.63	9,098.83	78.81	.001
IB X SI	8	3,420.05	427.51	3.70	.001
Error	144	16,624.73	115.45		
SP X IB	8	1,692.07	211.51	3.70	.001
SP X SI X IB	8	477.50	59.69	1.04	
Error	144	8,235.23	57.19		

quency of infant behavior was not a function of the specific sex of parent-sex of infant pairing in the triad. Figure 1 presents a graph of the mean frequencies of infant behaviors according to the sex of parent-sex of infant pairings.

The Sex of Infant x Infant Behavior interaction was significant, indicating that sex of infant had a differential effect across the nine coded infant behaviors. Since this interaction was significant, a simple main effects analysis was performed to explore further the differential effects of infant sex on the emitting of infant behaviors. These results appear in Table 18. Infant Sex x Vocalizing, Infant

TABLE 18

Summary Table for Simple Main Effects of the Infant Behavior x Sex of Infant Interaction

Source	df	SS	MS	F	P<
Sex x Vocalizing	1	25.09	25.09	8.17	.01
Sex x Looking	1	29.38	29.38	9.57	.01
Sex x Smiling	1	.03	.03	1	
Sex x Touching	1	12.70	12.70	4.14	.05
Sex s Reaching	1	5.20	5.20	1.69	
Sex x Proximity	1	.00	.00	1	
Sex x Laughing	1	.08	.08	1	
Sex x Crying	1	.27	.27	1	
Sex x Observer	1	1.46	1.46	1	
Behaviors x Female	8	964.75	120.60	39.28	.001
Behaviors x Male	8	569.59	79.20	35.80	.001
Error	144	441.40	3.07		

Sex x Looking and Infant Sex x Touching were all significant interactions. According to the means data presented in Table 16 female infants had higher mean frequencies of each of

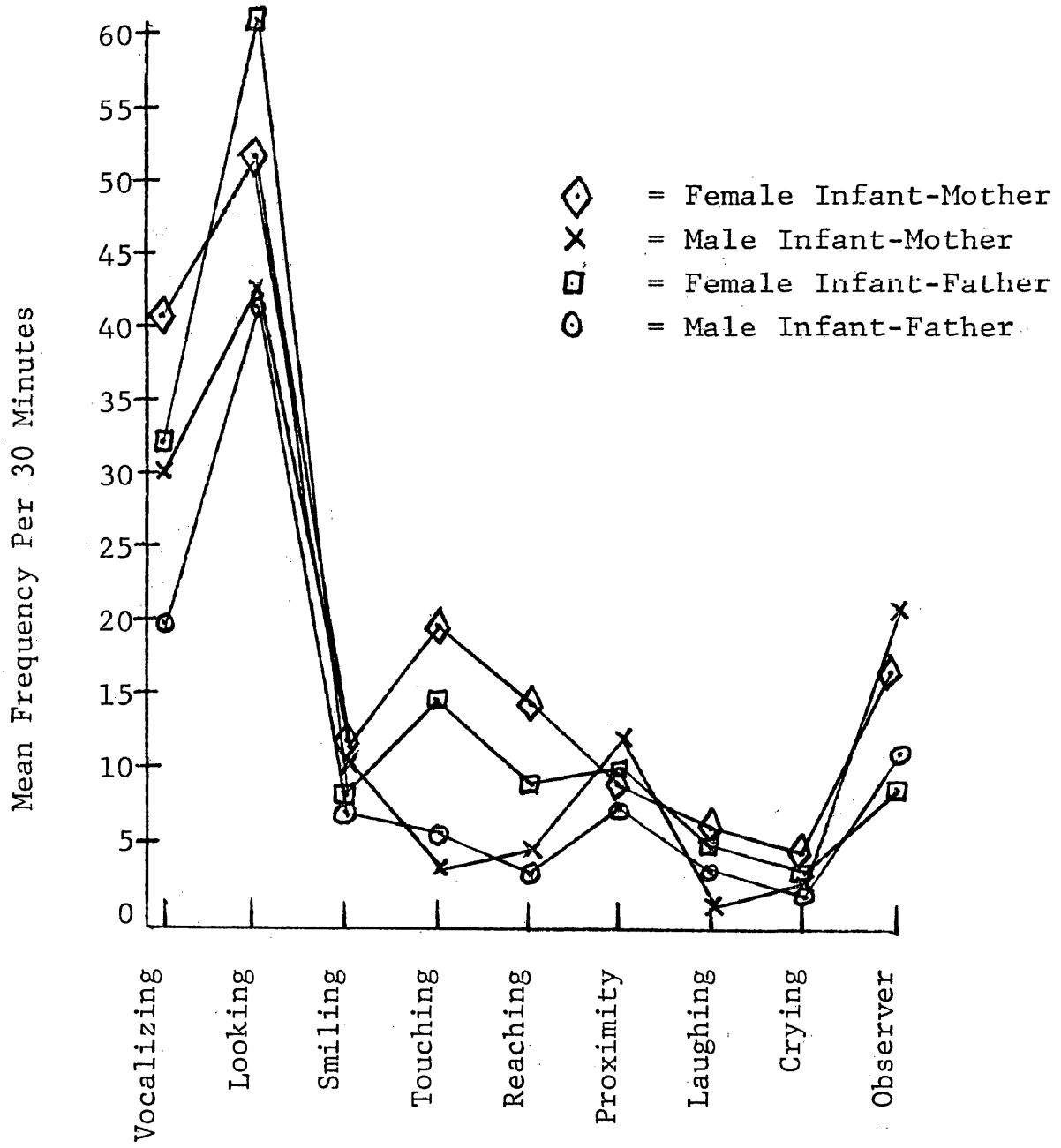

FIGURE I. Mean Frequencies for the Nine Infant Behaviors for the Sex of Infant-Sex of Parent Pairing in the Triad

these behaviors. In addition, the Infant Behavior x Female Infant and Infant Behavior x Male Infant interactions were significant. However, no further comparisons were made, as these results are not pertinent to the hypotheses. The Sex of Parent x Infant Behavior interaction was also significant, indicating differential rates of emitted infant behaviors across parental sex. A simple main effects analysis was performed and the results are presented in Table 19. The

TABLE 19

Summary Table for the Simple Main Effects of the Infant Behavior x Sex of Parent Interaction

Source	df	SS	MS	F	P<
Sex x Vocalizing	1	8.95	8.95	3.17	.05
Sex x Looking	1	1.85	1.85	1	
Sex x Smiling	1	1.44	1.44	1	
Sex x Touching	1	.29	.29	1	
Sex x Reaching	1	1.41	1.41	1	
Sex x Proximity	1	.31	.31	1	
Sex x Laughing	1	.03	.03	1	
Sex x Crying	1	.06	.06	1	
Sex x Observer	1	10.51	10.51	3.73	.05
Behaviors x Mother	8	354.96	44.37	15.73	.001
Behaviors x Father	8	389.83	48.73	17.28	.001
Error	144	328.75	2.82		

Sex of Parent x Vocalizing and Sex of Parent x Response to Observer interactions were significant. According to the means data presented in Table 16, mothers had higher mean frequencies in both of these interactions. Further, the Infant Behavior x Mother and Infant Behavior x Father in-

teractions were significant. No further comparisons were made for this interaction. Finally, the Sex of Parent x Sex of Infant x Infant Behaviors interaction was not significant.

Parent Behavior in the Dyad

The parent behaviors in the dyad settings were recorded and scored for frequency of occurence in the mother-infant and father-infant interactions. The mean frequencies for the various parent behaviors are prsented in Table 20. A

TABLE 20

Mean Frequencies for the Seven Parent Behaviors in the Dyad Setting

	Mother			Father		
Parent Behavior	Female Infant	Male Infant	Combined	Female Infant	Male Infant	Combined
Vocalizing	127.9	150.5	139.2	184.0	225.6	204.8
Looking	97.3	95.7	96.5	134.5	93.5	114.0
Smiling	32.0	32.0	32.0	33.3	32.2	32.8
Holding	12.0	11.0	11.7	14.1	10.8	12.5
Physical Stimulation	29.6	39.0	34.3	51.1	66.1	58.6
Giving Objects	36.5	35.7	36.1	37.7	50.8	44.3
Punishment	0.2	0.8	0.5	0.2	0.2	0.2

repeated measures analysis of variance, using sex of parent and parent behaviors as the repeated measure factors, was performed on the parent-infant interaction data from the dyad settings to examine differences in the rates of parent behavior as a result of sex of parent, sex of infant, or the

sex or parent-sex of infant pairing. The sex of infant and sex of parent x sex of infant factors are the ones most relevant to the hypothesis, as they reveal the effect of infant sex on parental responding. The summary table for this analysis appears in Table 21. The significant effect for

TABLE 21

Analysis of Variance Summary for Frequency of Parent Behavior in the Dyad

Source	df	SS	MS	F	P<
Sex of Infant (SI)	1	1,014.6	1,014.6	0.16	
Error	18	111,835.3	6,213.1		
Sex of Parent (SP)	1	19,472.2	19,472.2	11.21	.01
SP x SI	1	7.9	7.9	.01	
Error	18	31,261.1	1,736.7		
Parent Behavior (PB)	6	870,754.1	145,125.6	68.45	.001
PB x SI	6	15,749.1	2,624.8	1.24	
Error	108	228,982.9	2,120.2		
SP x PB	6	33,204.8	5,534.1	6.97	.001
SP x SI x PB	6	5,351.4	891.9	1.12	
Error	108	85,773.4	794.2		

parent behavior indicates differences in the frequencies of the seven coded parental behaviors in the dyad settings. Further, sex of parent was a significant factor, indicating that mothers and fathers differed in their rates/frequencies of emitting the seven attachment and affilitive behaviors. Finally, the Sex of Parent x Parent Behavior interaction was significant, indicating that sex of parent had a differential effect across the seven coded parental behaviors. A

review of the combined mean frequencies for mothers and fathers in Table 20 reveals that fathers had a higher mean frequency on all seven parent behaviors, indicating that fathers are more responsive in the parent-infant dyad relationship than are mothers.

In light of the hypothesis that differential responsiveness is a function of the sex of parent-sex of infant pairing, the most significant result from this analysis is the non-significant factors: the sex of infant factor and the Sex of Parent x Sex of Infant interaction were not significant, indicating that parental behavior was not differentially effected by the sex of the infant or the interaction of infant sex with parent sex. Apparently, differences in parental behavior are a function of the sex of the parent and the specific attachment on affilative behavior being emitted. Differential parental responsiveness is a function of sex differences, which according to the infant triad analyses, are present at 8-months of age. Boys and girls, men and women respond differently.

Parental Holding Style

The type of parental holding style was classified according to one of the following categories: caretaking, playful, or discipline. These results appear in Table 22. The results indicate the three types of categorized holds occured with different frequencies. Fathers engaged in more

TABLE 22

Classification of Parental Holding Style

	Mothers		Fathers		
Category	Female Infant	Male Infant	Female Infant	Male Infant	Total
Caretaking	9	8	2	6	25
Discipline	0	1	0	0	1
Playful	1	1	8	4	14
Total	10	10	10	10	40

playful holds than mothers, whereas mothers engaged in more caretaking holds. Parents of female infants held their child in a manner consistent with parents of male infants. Sex of infant does not appear to be a significant factor in parental holding style.

Infant Response to Holding

Infant responses to parental holds were categorized according to one of the following: fussing or crying, readiness to cry, eye contract, smiling and/or positive vocalization, laughing and/or giggling. These results appear in Table 23. It is evident that the infants responses to their respective parental holds differed. There is a difference in the frequency of occurence for each of the categorized responses, suggesting differential responsivess among infants in response to their respective parental holds. Infants are more likely to laugh or giggle in response to being held by

TABLE 23

Classification of Infant Response to Parental Holding

	Mothers		Fathers		
Category	Female Infant	Male Infant	Female Infant	Male Infant	Total
Fussing or crying	0	2	0	1	3
Readiness to to cry	0	0	0	0	0
Eye Contact	5	6	2	3	16
Smiling and/ or Positive Vocalization	4	2	4	2	12
Laughing and/ or Giggling	1	0	4	4	9
Totals	10	10	10	10	40

their father, whereas infants are more likely to respond to a maternal hold with eye contact. Thus, differential responsiveness among infants seems to be a function of unique individual differences and the idiosyncatic make-up of each parent-infant dyad. Apparently, infants have a tendency to respond somewhat differently to parental holds.

Parental Teaching Strategies

The type of teaching strategy employed by each parent in instructing their infant on the retrieval task was scored as: verbal instructions, modeling, modeling and verbalizing,

or prompting. These results appear in Table 24. It is evident that there are specific differences in the types of

TABLE 24

Categorization of the Types of

Parental Teaching Strategy

	Mothers		Fathers		
	Female Infant	Male Infant	Female Infant	Male Infant	Totals
Verbal Instructions	4	3	2	2	11
Modeling	1	0	1	1	3
Modeling and Verbalizing	5	7	7	7	26
Prompting	0	0	0	0	0
Totals	10	10	10	10	40

teaching strategy utilized by parents. Both mothers and fathers employed modeling and verbailization styles more than all other categories combined. Neither sex of parent or sex of infant appear to be a major factor in the differential use of specific teaching strategies. These results support Kaye's (1975) contention that middle-class parents utilize the teaching strategy most beneficial to the child: modeling and verbalizing.

Attachment Analysis

A proximity-seeking time measure was used in the evaluation of infant attachment. The time required for each in-

fant to approach his/her mother and father from a distance of ten feet was recorded and analyzed to ascertain differences between male and female infants in this proximity seeking measure. Since one male and one female infant did not crawl, their results were deleted from the analysis. In addition, the scores (times) from this measure were skewed; therefore, log (x + 1) transformations were performed on the raw data. Table 25 presents the means and standard deviations for the transformed proximity seeking time measures. A repeated measures analysis of variance,

TABLE 25

Means and Standard Deviations for the Proximity Seeking Time Measures

	Time to Mothers	Time to Fathers
Female Infants	1.19 sec. SD=.53	1.18 sec. SD=.51
Male Infants	1.37 sec. SD=.33	1.31 sec. SD=.37

using sex of parent as the repeated factor, was performed on the proximity seeking time data to ascertain differences between female and male infants in the time required to approach their mothers and fathers from a distance of ten feet. The summary table for this analysis appears in Table 26. All of the resulting F-ratios were non-significant, indicating that male and female infants did not differ significantly in time spent in proximity seeking, whether

TABLE 26

Analysis of Variance Summary for the

Proximity Seeking Time Measures

Source	df	SS	MS	F	P
Sex of Infant (1)	1	.196	.196	.518	n.s.
Error	16	6.053	.379		
Sex of Parent (P)	1	.005	.005	.361	n.s.
P x I	1	.011	.011	.697	n.s.
Error	16	.208	.013		

approaching either the mother or the father. This result leads support to the argument that 8-month-old female and male infants are equally attached to both parents.

Although there were no significant sex effects in the proximity seeking data, results from the dyad interaction data indicated that sex differences emerged for time spent by infants in proximity to their parents. The significant factor was sex of parent. Infants spent considerable more time in proximity with their fathers than with their mothers, $\underline{t}$ (19) <.001. Sex of infant was not a significant factor in time spent with mothers or fathers.

A second index of attachment was that of selective responding. The infant was placed ten feet from both parents, and the time utilized by each infant to crawl to his/her mother and father was recorded across four triads. The data was transformed by use of log (x+1) transformation and the results were deleted for the two non-crawling infants.

The means and standard deviation for the transformed selective responding time measures appear in Table 27. A repeated analysis of variance, using sex of parent as the repeated factor, was performed on the selective responding time data to ascertain differences between the time required by infants to approach their mothers and fathers. The summary

TABLE 27

Means and Standard Deviations for the Selective Responding Time Measures

	Time to Mothers		Time to Fathers	
Female Infants	1.29 sec.	SD=.59	1.48 sec.	SD=.62
Male Infants	1.51 sec.	SD=.41	1.48 sec.	SD=.40

table for this analysis appears in Table 28. Male and female infants responded selectively to one parent as frequently as to the other. The results from the repeated

TABLE 28

Analysis of Variance Summary for Selective Responding

Source	df	SS	MS	F	P
Sex of Infant (I)	1	.113	.113	.235	n.s.
Error	16	7.698	.481		
Sex of Parent (P)	1	.056	.056	1.158	n.s.
P x I	1	.094	.094	1.940	n.s.
Error	16	.774	.048		

measures analysis of variance showed no significant differences in the time male and female infants utilize in responding selectively by crawling to one parent or the other. In all cases the infant responded selectively to a parent instead of the observer(s).

The results from both the proximity seeking and the selective responding measures reveal no difference in female and male infant responding, whether they are responding to mothers or fathers. These results support the hypothesis that both male and female infants are equally attached to both parents at 8-months.

Chapter IV

DISCUSSION

Overall, the data from the present study show that the parent-infant interactional process is bi-directional. That is, the influence of a stimulus by one participant on subsequent responding of the other participant is reciprocal. It appears that the infant influences the parent and the parent influences the infant. But, sex differences in this interaction setting are quite evident. One of the major factors responsible for the specific make-up of an interaction pattern is the setting in which the interaction is taking place, and the number of persons present. Mother-infant and father-infant interaction patterns are significantly different from each other, both quantitatively and qualitatively. The response to play with father was more positive than with mother, but this effect seemed to occur because fathers engaged the infants in more physically stimulating and unpredictable games. Fathers interacted with infants mainly in a playful, affiliative manner. On the other hand, mothers engaged in more caretaking behavior than did the fathers. Both parents interacted with their infant in a consistent and predictable fashion. The parent-infant interaction process seems to represent a well-practiced game, and the nature of the interaction sequence alters the individuals respon-

siveness.

The interaction results denote that fathers contribute substantially to the parent-infant interactional relationships, and the role of the father in attachment. The mother's role in attachment and parent-infant relationships has been well documented in the literature (e.g., Ainsworth, 1964; Osofsky, Note 9; Stern, 1974; Wigert and LaVoie, Note 11), but the nature of the fathers role has been given little attention (Kotelchuck, Note 4; Lamb, Note 5, Parke & Sawin, Note 10). The research findings of Lamb (Note 5) and Cohen and Campos (1975) show that infants form an attachment bond with each parent at a very early age. Although the bonds are well-formed at 8-months of age, the nature and the expression of the relationships differ. That is, differences are evident not only in the mother-infant and father-infant dyad relationships, but the pattern of behaviors emitted by the infants in the triad setting. Infant responses in the triad may differ radically from those in the dyad setting because of differing parental behavior, as well as varying infant goal-directed behavior. Feldman (1966) investigated the impact of the birth of the first child on the marital pair and found that for many couples the advent of the child alters the basic interaction pattern of husband and wife. If this is true, then one would expect triad interactions to differ from the dyad interactions on the basis of changing

parental behavior, regardless of the setting change on the infant. Infant behavior alters with stimulus change; parental stimulus behavior changes in the triad, resulting in differing interaction patterns. The changing of a dyad to a triad setting is a great structural change which requires adaptation in responding. Lamb (1976) showed that infant interactions with a parent are effected by the presence or absence of the second parent. The presence of both parents alters the attachment behaviors of the child. Parents are well influenced by the "cohort effect", interacting less with the child less when both are present. Affiliative behaviors seem to be controlled by the extent to which adults in the situation appear friendly. Parents are less friendly toward their child in the dyad as compared to the triad (Lamb, 1976a). Therefore, since parents change from the dyad to the triad, it is evident that the infant changes too, since parent-infant relationships are interactional and reciprocal.

A closer examination of the triad interactions reveal that female infants responded in a similar manner to both parents, whereas male infants did not. The correlations between female-infant responses to mother and female-infant response to father were significant for these attachment behaviors: vocalizing, looking, touching, reaching to, 3' proximity and laughing. Virtually none of the correlations

of male infant-mother and male infant-father responding in the triad were significant. Similarly, female responses in the triadic setting were correlated with their responses to parents in the dyadic setting for looking, crying, and proximity seeking. Responses of male infants in the triad differed from their responses in the dyad. It appears that female infants behave consistently across situations, whereas male infants are more situationally specific in their responding.

Analysis of parent behaviors in the dyad setting show that parents were more consistent in their initiation of responses to a female infant than to a male infant. This response pattern also appeared in the triad where parents vocalized to, smiled at, looked at, and held their female infant more than their male infant. Parents looked at and vocalized to their male infant less in the triad than in the dyad, which suggests that the nature of the relationship changes more for males than females when a third person enters into an interactive relationship.

In addition, when mother, father and infant are together in the triad setting, the parents are responded to differently as a function of the sex of the infant. In correlating the infant's responses to the mother with the infant's responses to the father, some interesting results were obtained. For the affiliative and attachment behaviors of

looking, touching, reaching to, proximity seeking and crying, the correlations between female infant-mother and female infant-father responses were significant. However, for the same behaviors, none of the correlations between male infant-mother and male-infant-father responses were significant. These data tend to support the argument for sex differences in the display of attachment behaviors. Female infants exhibited no preference toward either parent in the triad setting, whereas male infants indicated a preference for one parent or the other, contingent on the attachment behavior emitted. This difference appears to be due, in part, to differential parental treatment of male and female infants.

To further understand the relationship of the father to his infant, one can examine other findings depicting differential responsiveness on the part of the father. For example, Lamb (Note 5) has reported that the infant's interaction with the father is more varied and unpredictable than with the mother. In the present study, fathers engaged their female infant in more vigorous physical stimulation than their male infant; however, fathers of male infants generally were more playful (e.g., giving toys, playing games, initiating responses, etc.) than fathers of female infants. Fathers also seem to be more action oriented, as demonstrated by their physical engagement in the play be-

havior and interaction with the infant. The mother is more supportive and encouraging of the infant's play through verbalization and focused attention, while providing less contact. However, mothers tended to hold, stroke and soothe female infants more than male infants. Analysis of the dyad interaction revealed that fathers initiated both attachment and affiliative behaviors more frequently than mothers, suggesting that fathers are more playful, responsive and aggressive in interactive relationships.

The basic teaching strategy adopted by the parents in the present investigation was one of modeling and verbalizing. In the "detour task" the parents were faced with the task of teaching their infant to grasp and retain a toy which was placed behind a barrier. The modeling of the retrieval of the toy by the parent provided the infant with a behavior to imitate. The task was sensitive to the skills of the infant, since 8-month-olds are capable of reaching out, locomoting, grasping and retaining. In addition, infants of this age engage in purposeful behavior (Cohen & Campos, 1975; Lamb, Note 5). During the teaching task, mothers tended to instruct the infant to retrieve the toy and then modeled the activity, whereas fathers modeled the retrieval of the toy and then instructed the infant to retrieve the toy. This finding is important in that both mothers and fathers use modeling and instructions to teach their infants.

But mothers engage in more verbal content than do fathers, which lends support to the contention that mothers provide more verbal stimulation to the infant and therefore facilitate language development of the infant more than the father. Clarke-Stewart (1973) reported that the single maternal variable highly related to the child's competence was verbal stimulation. To further explain the differences in the role of the mother and the role of the father in parent-infant interactional relationships it is necessary to examine the attachment findings.

Infant attachment to the parent has been found to be highly correlated with parent responsvieness (Ainsworth & Wittig, 1969; Wigert & LaVoie, Note 11). In addition, the data from the present investigation suggest that attachment is a function of selective responding (Cohen, 1974), proximity seeking behavior (Ainsworth, 1973; Cohen & Campos, 1974), and parental responsiveness (Ainsworth, 1973). Using proximity seeking and selective responding as measures of attachment, there were no differences in the strength of attachment between male and female infants and their respective mothers and fathers, although infants had longer durations of time in close proximity with the father than with the mother. Perhaps infants spend more time in close proximity with their fathers than with their mothers because fathers are a more novel stimulus due to less exposure.

Most fathers are away from the home most of the day due to work commitments. In the present study, all of the mothers were homemakers, and only 3 of the 20 had part time jobs.

Lamb (Note 5) has noted more affiliative type interaction with the father than with the mother. The data from the present study further support this observation. In addition, it appears that fathers initiate significantly more playful behavior through the giving of toys and other objects to their infant than mothers. Parke and Sawin (Note 10) and Thoman, Liederman and Olson (1972) have reported that fathers engage their infants in more physically stimulating play than do mothers. This finding also supports the earlier claims of Lamb (Note 6) and Ban and Lewis (1974) that the father is a person with whom the infant interacts in a pleasurable and stimulating fashion. Apparently neither mothers nor fathers are superior attachment figures, rather fathers are just more fun.

Perhaps a more interesting result from the present study is that fathers of female infants are more physical in their play behavior and stimulation than are fathers of male infants. Parental differences were also observed in holding patterns, with mothers holding infants in a caretaking manner, while fathers were more playful. When the infant was in the triad setting, he/she sought to be held by the father during playful activity while seeking the

mother during periods of crying, pouting, or distress. Clarke-Steward (1973) reported that physical handling that is gentle, firm, close, and relatively frequent seems to have a beneficial effect on the infant's early cognitive and motor development and on attachment and responsivenss to the mother. The typical response by the infant when being held by the mother was one of eye contact and/or smiling and vocalizing, whereas the infant's response to being held by the father was laughing and giggling, or smiling and vocalizing. These findings provide further support for the qualitative differences in interaction where fathers engage in more affiliative type behaviors and mothers in attachment type behaviors. However, the absence of significant differences in attachment to either parent suggests that both types of interaction results in attachment. That is, attachment is not more likely to occur as the result of attachment response than of affiliative responses. Ainsworth and her colleagues (e.g., Ainsworth, Bell & Stayton, 1972) have argued that it should be possible to identify attachment figures by the quality of the response to being held by the attachment object. Differential responsiveness to mothers and fathers by attached infants indicates that both figures are important in the infant's social world, expecially when selective responding occurs to both parents. While the infant-mother and infant-father interactive relationships

may differ both quantitatively and qualitatively, both are vital to the social and emotional development of the infant (Kotelchuck, Note 4; Lamb, Note 5). The present findings indicate that the attachment behaviors of looking, vocalizing and smiling occurred frequently in all parent-infant interaction sequences. This indicates a presence of "social attention" which leads to contingent responsiveness on the part of the participants, a vital factor in infant attachment. Clarke-Stewart (1973) reported looking at and vocalizing to the mother caused the mother to be less rejecting and more responsive to the infant's distress and demands. The more frequently the child looked, smiled, or vocalized to the mother, the greater the maternal affection, attachment and responsiveness to the infant. Obviously, the infant's social behaviors are an influential force in the parent-infant interaction. The reciprocal nature of parent-infant relations is demonstrated by those findings which illustrate, over time, that both parents and infants effect each other's behavior.

In summary, the results of this investigation show that the father has a definite role in parent-infant interactional relationships. Further, the present findings support the position taken by Ban and Lewis (1974) that attachment behavior directed toward the father is different from that directed toward the mother. As noted by Lamb (1977), in-

fants engage in more affiliative-type behaviors with fathers and more attachment behaviors with mothers. There are definitive qualitative and quantitative differences between the mother-infant and the father-infant relationships, as evidenced in the present investigation and also as reported by Lamb (Note 5). However, it is not possible to assert causal directions although the relationships are interactive. Clarke-Steward (1973) argued that "no-cause" comparisons are appropriate, as some correlations for infant attachment suggested that maternal attention was causing an increase in infant attachment, whereas other correlations of interactive behaviors indicated that infant attachment was cuasing maternal attention and responsiveness. This findings suggests the possibility that, as parent and infant search for harmonious, balanced interaction over the course of development, first one, then the other assumes the causal role (Clarke-Stewart, 1973).

The present investigation, in part, responded to the requests of Kotelchuck (Note 4), Parke and Sawin (Note 10) and Lamb (Note 5) to provide more research into the role of the father in parent-infant relationships and attachment. The focus in this study emphasizes the need to view the interaction process as bi-directional, considering the parent-infant as well as the infant-parent relationship. Subtle interaction cues from the participants lead to dif-

ferential responsiveness. Future research should include a more detailed descriptive analysis of play behavior and teaching strategies involving the parent and the infant in the natural setting of the home. To understand the nuclear family and the socialization of the child, we need to know more completely the role of the mother, father and infant in the attachment, affiliative and interactional relationships. Finally, a caveat about the findings of this study. Since the subjects in this study were white middle-class, first-born infants any genearlizations beyond this population is questionable.

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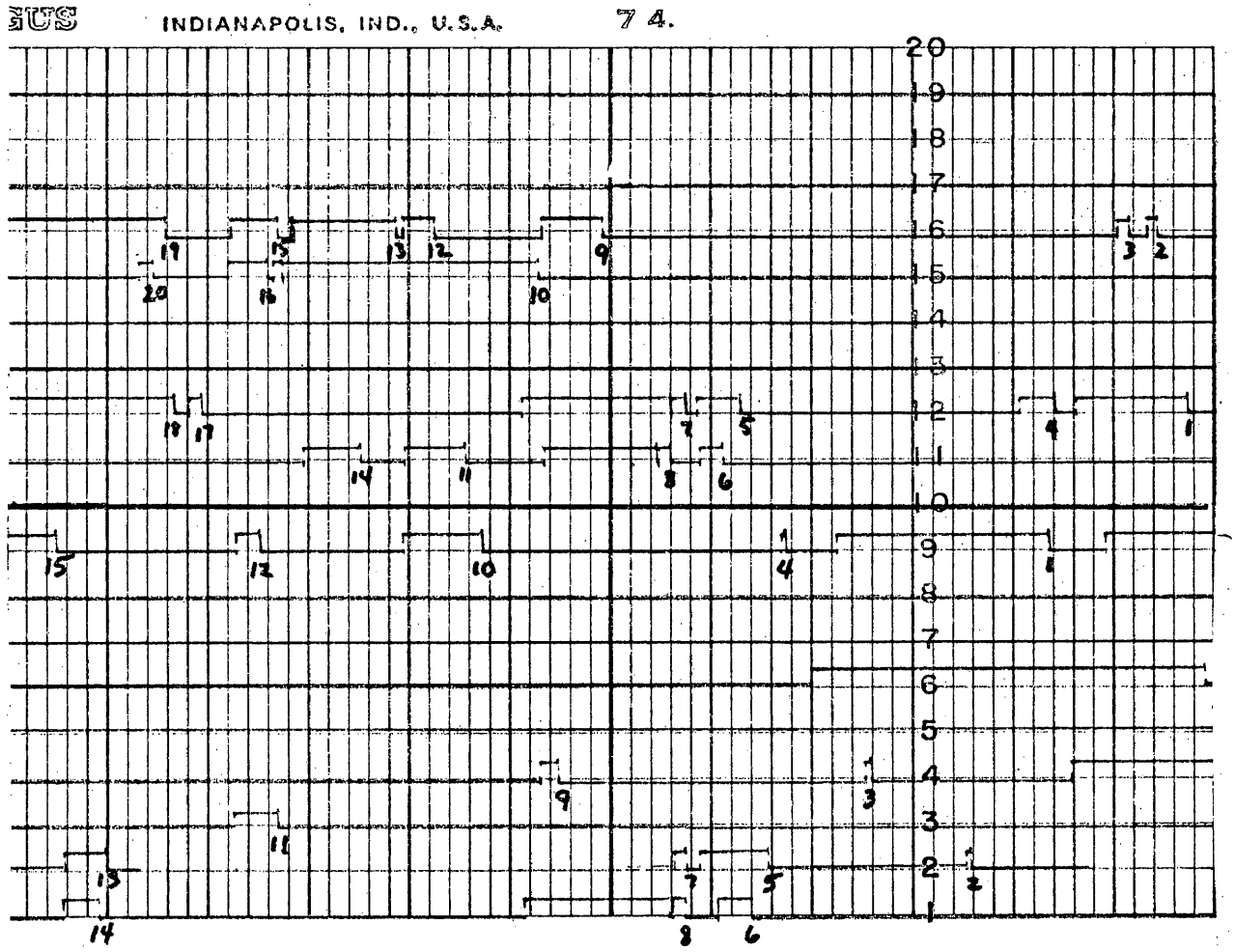
Appendix A

Instructions for Scoring the Interaction Tapes.

The interaction tape from the event recorder consists of twenty lines. On lines #1-#19 infant behaviors were recorded, and parent behaviors were recorded on lines #11-#20.



Sample section of interaction tape

The interaction, as recorded, proceeds from right-to-left on the tape, The tape is marked with 2-second time intervals.

Each behavior was scored for the total frequency of occurrence over 30 minutes, and for average duration of each response (total frequency ÷ total duration). In addition, each interaction tape from the dyad setting was scored for infant-to-parent and parent-to-infant directionality. The scoring instructions for this were as follows:

1. Draw a line on line #10 to separate parent and infant behaviors.
2. Number the stimuli on lines #1-#9 in order of occurrence, working from right to left.
3. Record the line # on which each stimuli occurred under the "stimulus" column.
4. Record the first response from lines #11-#20 to the stimulus numbered on lines #1-#9. Do this by recording the line # on which it occurs under the column headed "Response." However, if another stimulus occurred on lines #1-#9 before a response on lines #11-#20, record a zero (0) response. Do this for every stimulus.
5. Repeat the process by numbering the stimuli on lines #11-#20 from right-to-left. Record the line # of each stimulus, then record the line # of the first response following it from the responses on lines #1-#9. Again, if the next stimulus occurs before a response, record a zero (0) response. Do

this for every stimuli.

Sample recording from the above sample interaction tape

	Infant-to-Parent			Parent-to-Infant	
	Stimulus line#	Response line#		Stimulus line#	Response line#
1.	9	0	1.	12	0
2.	2	0	2.	16	0
3.	4	0	3.	16	0
4.	9	0	4.	12	9
5.	2	0	5.	12	0
6.	1	12	6.	11	7
7.	2	0	7.	12	1
8.	1	8	8.	11	0
9.	4	15	9.	16	4
10.	9	11	10.	15	9
11.	3	16	11.	11	0
12.	9	12	12.	16	0
13.	2	0	13.	16	0
14.	1	0	14.	11	0
15.	9	0	15.	16	3
			16.	15	9
			17.	12	0
			18.	12	0
			19.	16	0
			20.	15	0